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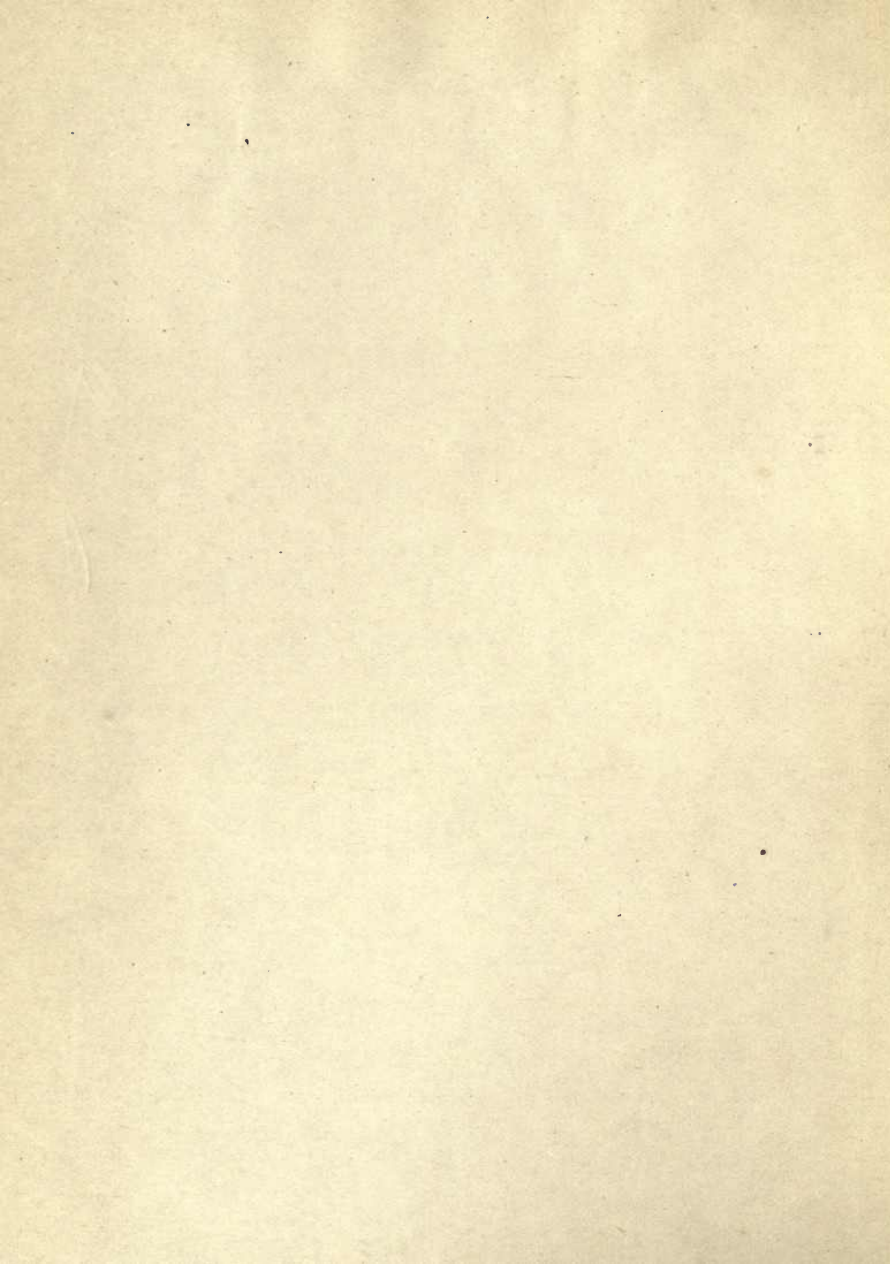






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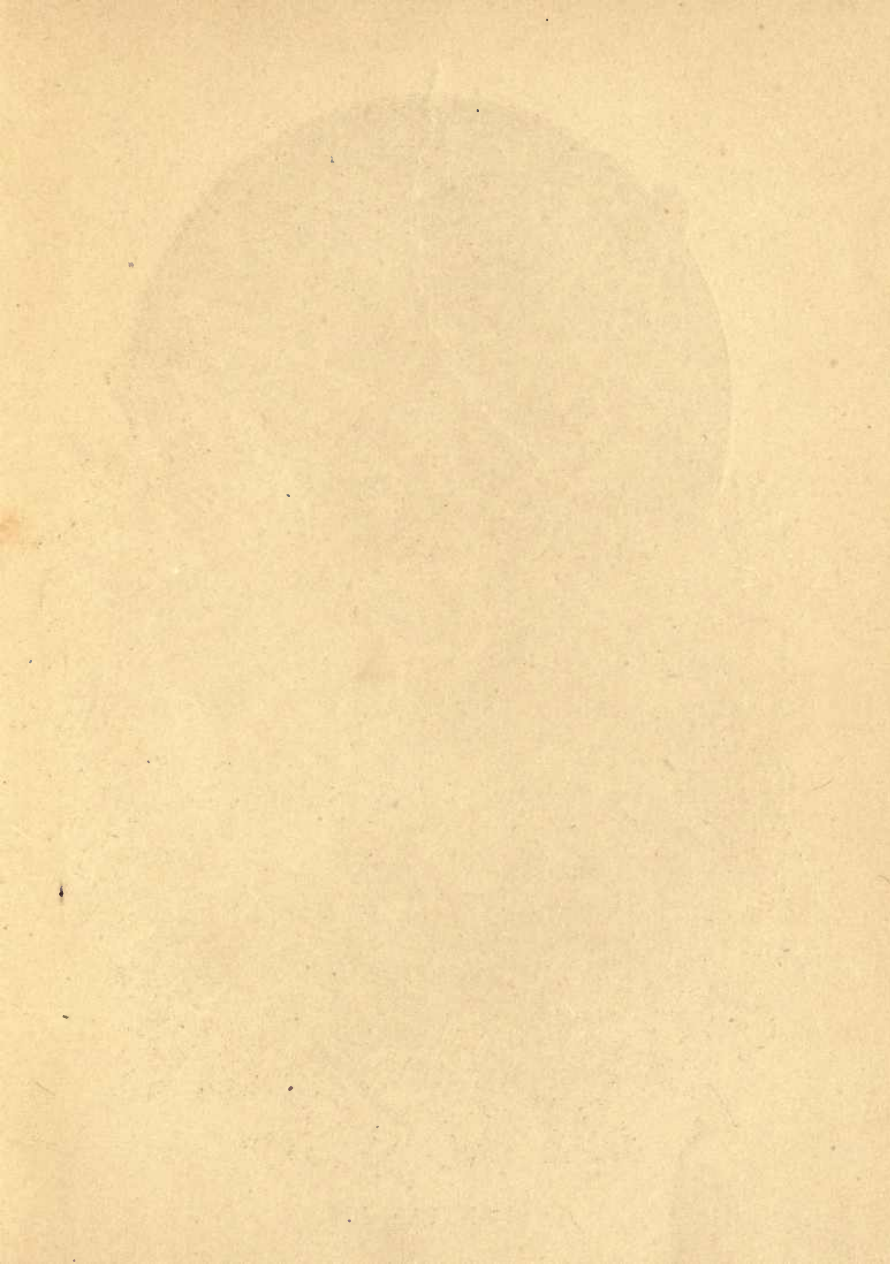
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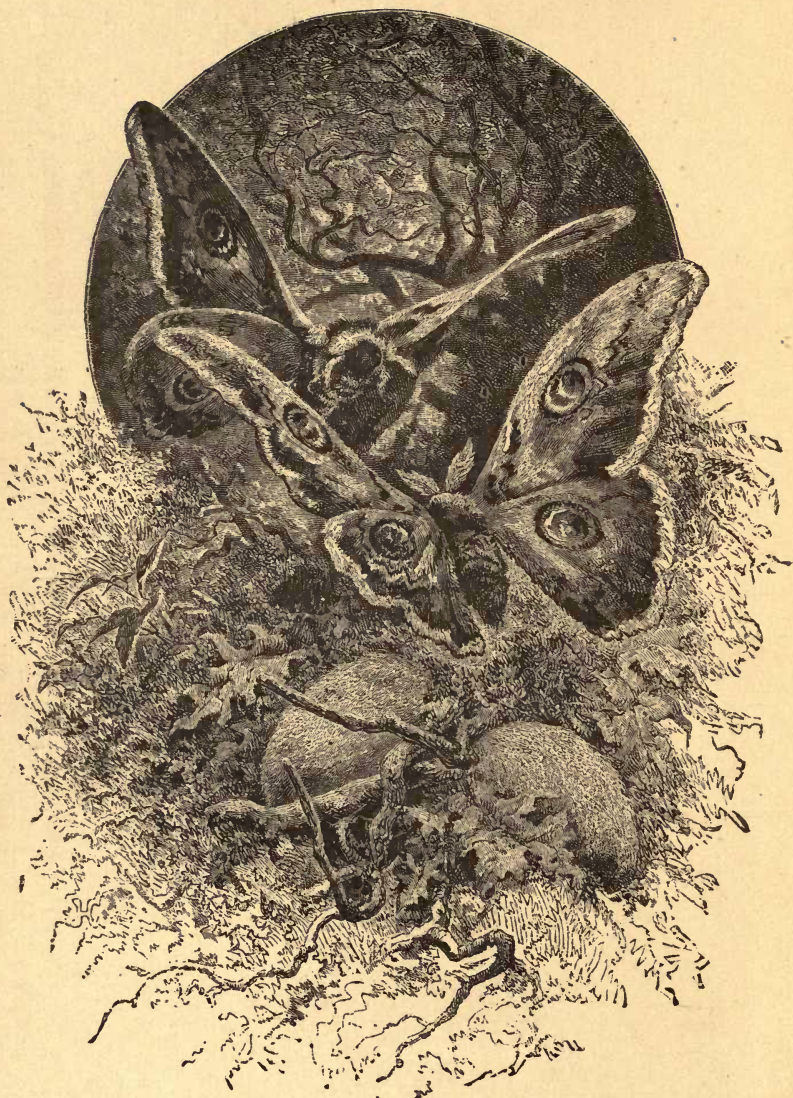


A. Hall Burdick
Nelson,
N. Y.

. 75-

March, 1883.





FRONTISPIECE.

INSECT LIVES

OR

BORN IN PRISON

BY

JULIA P. BALLARD

AUTHOR OF "BUILDING STORIES," "SEVEN YEARS FROM TO-NIGHT,"
"A LITTLE LIFE," ETC., ETC.



CINCINNATI
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1879

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PREFACE.

How shall we interest children? How shall we *most* interest them?
How shall we *best* interest them?

You give to your boy a glass ball. It is clear and beautiful. He can amuse himself with it. How? Not by studying it, but by rolling or catching it. Tell him to put the ball under a glass cover and watch it. Tell him to wait and look again and see what he will find. "Nothing," he says, "but a ball." He is right. Man made it, and all the beauty it will ever have it has now. Give him a microscope. What does he see? A little coarser texture, perhaps a flaw, a bubble of confined air, but only the same glass ball. Go with him to the forest. Pick from an oak branch a plain brown ball. Is this *only* a ball? Put it under a glass. Look again and you will find it is more than a ball. It is a home. The doors will soon open and the family disperse. Watch. There goes one in full dress out on an early promenade. With what ease and grace it walks up and down its prison of glass. Another follows. There is a large family for so small a house. Who built it? Was it cast in a mold by a man? God made it, and all the beauty it has is not seen at first. Take the microscope. No roughness is revealed, no flaw, but exquisite beauty and finish in every part of the house, in every part of each perfect inmate. Suppose a boy could buy a glass ball that would develop such wonderful secrets. What merchant could supply the market? Aladdin's lamp would be at a discount.

You give your girl a silk "beechnut-box." Some of them will know

what I mean: a three-sided box, made of card-board and covered and lined with silk, such as only grandmothers can probably make now. She looks at it. It seems solid. Press it and it opens. One side has been left without being closed. What can she do with it? It is better than a ball. It will hold something. She can use it. But the box itself, what will it come to? Tell her to put the box under a glass and see what it will get to be. She will laugh and tell you, "only a box." All there is to it she sees at once. Try the microscope. Only a little coarser silk.

Here is a green "beechnut-box" I have found on a walnut leaf. It is very small—no larger than a beechnut and looking much like a green one. Is it a box? Let us try the microscope. It is embroidered on the sides and back. There are small patterns in diamonds in brown and drab. While you look it moves. Put it under a glass and watch. Is it a home? Put a bit of walnut leaf by it. What is that moving just under one of the pointed ends? It is a head. The leaf begins to disappear, the owner of the box, the *Limacodes scapha*, is taking his breakfast.

Which will you prefer, the glass ball or the round brown house, the silk box or the curious living thing that has surprised you and holds in reserve a still greater surprise?

It is with the hope of getting this question answered in favor of living balls and boxes, of getting the key into the hand and getting the heart ready and anxious to unlock the many sources of beauty and interest which God has placed all about us in nature, that this little volume of "INSECT LIVES" has been written. That we may learn that while "it is the glory of God to conceal a thing," He is not only willing we should search out these hidden wonders, but will himself be glad in our new-found delight in them.

EASTON, PA., October, 1879.

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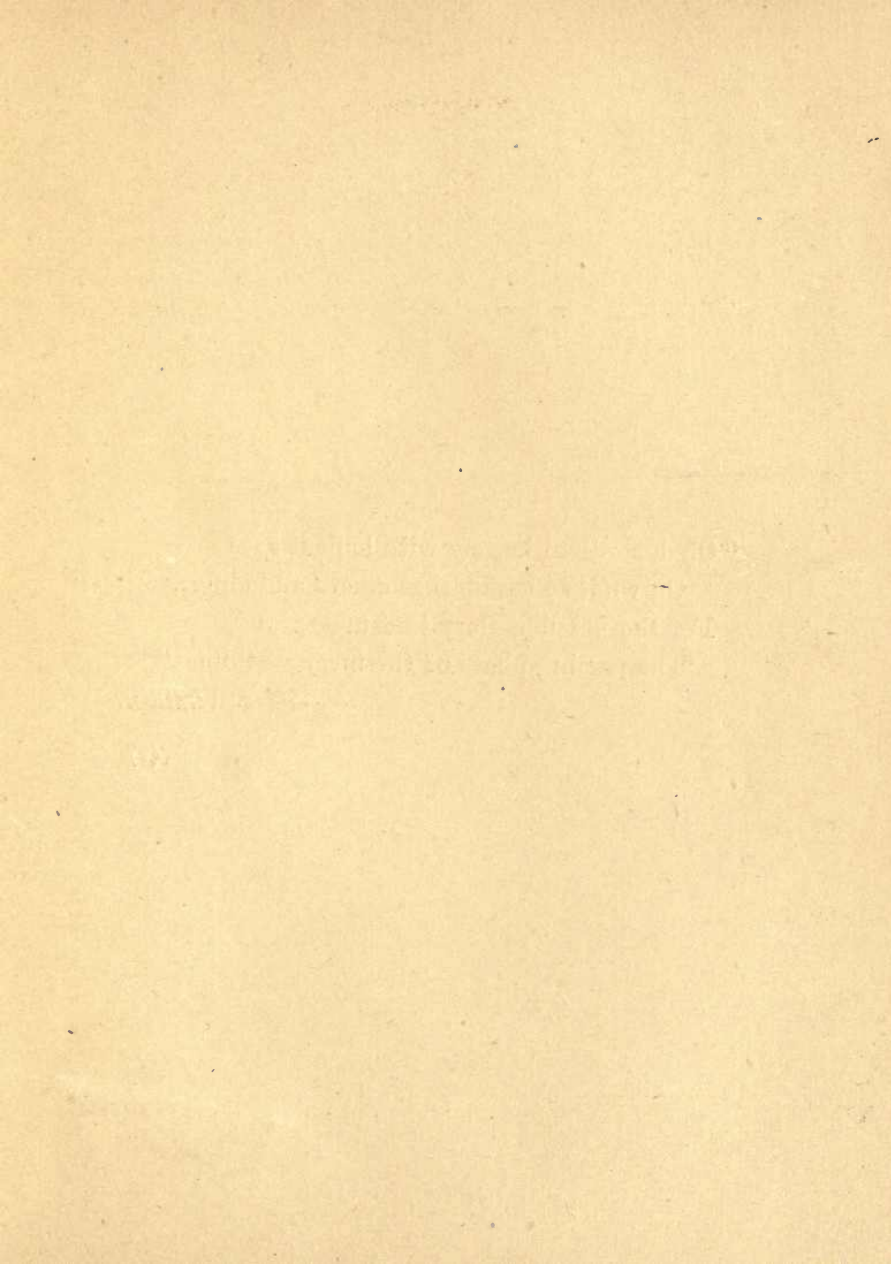
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“Oh look thou largely with lenient eyes
On what so beside thee creeps and clings,
For the possible glory that underlies
The passing phase of the meanest things.”

—*Mrs. Whitney.*



Insect Lives. OR Born in Prison.

INTRODUCTORY.

I. "I know you. I know what you *have* been. I know what you *will* be." This it is delightful to be able to say to the caterpillar crossing your path slowly, or to the butterfly winging its way in the air before you—to look upon the common brown brush-like caterpillar, with black at each end of him

and say: "Plod on a little longer, good fellow, and you shall 'be a tiger moth!" or upon the small yellow and white butterfly, and say: "You, a little while ago, were a green caterpillar, making holes for dear life through a cabbage leaf!" And this may easily be accomplished with the aid of your own eyes and a microscope, and also (as butterflies and caterpillars do not go flying and crawling about labeled), by the help of authors who have studied and classified them.

"But how shall we catch the butterflies? With a net?"

Not at all. That may do very well if you care for nothing but their present beauty; but if you wish to know the butterfly you had better take an earlier chapter in his life. Of course the first thing would be the egg, but, as these are not so easily found, you can begin with the caterpillar, and in due time you will come round to the egg, and so have the whole at command. The smaller the caterpillar when you get him the better, because he is very fond of changing his coat, and, liking a variety, is apt to put on quite a different one each time. Sometimes the second coat is much gayer than the first, even though *that* were a coat of many colors. Caterpillars usually change four times before going into a chrysalis state. Some butterfly caterpillars change five times (as the *Papilio philenor*), though the other *Papilios* of the Northern United States change but four, and some have but three changes; so that one who has never noticed them care-

fully will be much surprised, in studying them, at the immense variety in shape and color, and also the great beauty which many of them display.

I have seen more elaborate work in design and color, in a surface less than an inch in length, and in width no more than a sixth of an inch, in a small, unnoticed caterpillar, than I have ever seen in as much surface on any flower. And the microscope reveals here often an amazing amount of work and beauty little suspected without its aid.

While some caterpillars are hairy, and look like a little traveling clothes brush, others are knobbed, or spiny, like the porcupine, and others quite smooth. Some are handsomely dressed in scarlet and gold, with tufts of various colors grouped upon their bodies; and, strange as it may seem, some of the gayest and handsomest make the very dullest and homeliest moths. They have always *twelve rings*, called segments, besides a shelly head, and from ten to sixteen legs. They have a little conical tube or spinneret in the center of the upper lip, from which they spin the silk for their cocoons, or draw the silken thread, which some use instead, to fasten themselves with when changing into chrysalids. The change from one coat to another is something curious, but not much in comparison to the change from the caterpillar to the butterfly through the chrysalis state. Here the *form* is entirely altered. The mouth and manner of eating and kind of food are totally different.

II. "But how can I touch the caterpillars when I wish to get them?"

Do not touch them at all. Take a little box, and when you see one, with a pencil or stick gently push him into it, and carry him home. Get some plain glass tumblers, the larger the better. You can begin with one or two, but you will soon want a dozen. Put your caterpillar upon a white paper, which you have first placed on an old book, or other firm substance, and cover him with the glass. If you have several kinds at once, it is well to label the glasses. Write "Grape," or "Apple," or "Poplar," upon a slip of paper, and paste it upon the tumbler which covers the caterpillar you found upon the grape, apple, poplar, or other leaf. This will avoid confusion, as they one by one go into chrysalids. You can study each one separately, and you will know, as they come out of the chrysalids (which you have seen them make), just which is the moth of the grape, apple, or whatever your label indicates should be there. This you would forget more easily than one would suppose. You will thus know, also, at a moment's glance, how to feed them; as each caterpillar requires to be fed with whatever kind of leaf you found him upon. If upon the grape, give him grape leaves under the grape tumbler, and so on. You will soon begin to respect your caterpillar, and wonder at one thing at least about him, and that is, his power of selection. While there are a few, such as the common salt-

marsh caterpillar, that will eat several things, as clover, plantain, and grass, the most of them (at least so far as I have tried them) will condescend to do nothing of the kind. They know what they want, and that is more than can be said of some people. There is one kind of small caterpillar often found on the grape, and also on several other trees, which, although it prefers grape, will eat other leaves; but there are certain ones peculiar to the grape, and you may try one of these grape caterpillars with every other leaf of the garden, and he will turn away with disgust. Give him a grape leaf, and you are paid for your trouble at once.

It sometimes happens that you will find a caterpillar far from any tree or plant. Then you can practice with him, and if you can not find out from a book what he is, and what he should have, and fail to suit him with any variety of leaf at your command, you must either let him go, or see him die!

III. If you have very large caterpillars, such as the elm, or royal walnut, or that of the Polyphemus moth, it is easy to make a glass box (bound with narrow ribbon, and fastened at the corners), perhaps eight inches square and six or eight high, or a box covered with wire gauze. Such a box is better than the round shades which you could buy, for you can watch the insect much better through them, and see it without distortion. It also admits some air, which they require in order to do well. It is needed for the large moths also,

which, under a tumbler, could not expand their wings perfectly, much less make any use of them. Here you can watch the caterpillar dextrously fasten himself to the side of the glass, and change his coat once, twice, three, or four times, coming out each time fresh and bright, and with a keen appetite after the stupid supperless days each change costs him. You can see him spin his cocoon with such a wonderful skill that you look with amazement at the work; or, if he changes into a smooth chrysalis (as the *Asterias* butterfly), you can see him fasten the loop around his breast, which attaches him to the glass strongly enough to keep him in one position (either through a long or a short sleep), and at last stand the tug of opening for the escape of the butterfly. Besides this, if they are under glass, they are safe, and you too are safe in your knowledge of them. You know that whatever living thing is found under your glass when the chrysalis opens must have come out of *that* chrysalis, whether legitimately or not. The first *Ichneumon* fly I ever examined would have been brushed unceremoniously out of the window for a wasp, had he stolen out from an unguarded chrysalis. But, as he was born in prison, there he was. He came out of *that* chrysalis, and wasp or what not, he must be studied, and lo! the curious parasite was brought to light. Revelations of this kind will sometimes be made, which one would be slow to believe possible, but for there being, in this way, no possible room for doubt. I have had two caterpillars, for example, which were

just alike, spin each a cocoon exactly alike, each being under a glass of its own and labeled. After a time, on cutting open the cocoon carefully, so as not to injure the chrysalis (which may be easily done), one cocoon was found to contain a perfect chrysalis. The other contained the dead caterpillar and four rather small oval chrysalids. Finally, the *one* perfect chrysalis opened for the escape of a moth (*Apatela americana*), and the other four small chrysalids opened, and lo! six large flies, much resembling the house fly, only more spiny or hairy. There must have been two flies in two of the cocoons, as there were certainly two extra ones under the glass!

IV. The immense variety of caterpillars, and the great difference in their habits, and in their new and finished life as moth or butterfly, furnishes constant surprise and pleasure in their study. From egg to imago (which means the perfect insect or butterfly) they are a study which can not fail to excite wonder, and lead us, from admiration of their beauty and skill, to adoration of Him whose work is perfect though invisible, and whose ways, studied never so closely, are still "past finding out."

To render our researches most effectual and satisfactory, we should not begin with statistics—studying how many thousands of moths and butterflies there are supposed to be, or how many species of insects have been classified and named. Take "one to begin," as children say, and study it thor-

oughly. From books such as those of Edwards, Harris, Packard, or Tenney, find the name of your caterpillar, and know, before he changes, what sort of butterfly you are to have; unless you are fortunate enough to find one not described, and then you can have the honor of naming him yourself. In this way the more scientific knowledge to be obtained from books you will soon find it impossible to do without. You will find that while it is pleasant to be sent from books to nature, it is more pleasant to find out secrets from nature, and let her send you to the books to verify them.


V. But there are a few things you should know from books before you begin, and one is, that the whole class of butterflies and moths is called LEPIDOPTERA; and that this class contains only Butterflies, Moths, and Hawk-Moths. Flies, beetles, and other insects come under different classes.

The *Butterflies* have delicate thread-like antennæ, and these are always knobbed or thickened at the end. They always fly by day, and their caterpillars have sixteen legs—six small tapering-jointed ones (which are the true feet) from the first three rings back of the head, and a pair of larger and more fleshy legs to each of the other segments except the fourth, fifth, tenth, and eleventh.

The *Hawk-Moths* have long narrow wings, and some of them look very much like little hummingbirds. Their antennæ are tapering (usually broader in the middle), and

never knobbed. They fly rarely during the day, but mostly in the morning and evening twilight.

The *Moths* have not narrow wings. Their antennæ are not knobbed but usually taper from base to tip, and are not broader in the middle like those of hawk-moths. Some of them are spined and some plumed. They fly at night chiefly. So you can always tell a butterfly from a moth by the antennæ, and a hawk-moth from a moth by its wings.

The eggs are very different in size, shape, and color. Some are clear and round like little crystal beads, and formed on a leaf in a close circle. Sometimes they are in exact rows and of an amber color. Again, like those of the *Polyphemus* moth, they are chocolate colored, circular, flat, and quite large. The eggs of this moth are shaped like biscuit, and have two white rings around the edge. Some eggs now before me, found to-day in a walk to the woods, and unknown to me, are white, as if made of milk glass. They are on a large forest leaf, and there are just ninety-one of them, and yet I could cover the whole with a thimble. They look like plain "chalk beads," and may be easily counted with the naked eye, but look at them through a microscope, and their exquisite beauty appears. They are all precisely alike, having sixteen or eighteen symmetrical grooves diverging from a small circle in the center like this:  FIG. 1.

And what is more wonderful than the finish of the egg, is, that the different kinds of eggs are always placed upon that

kind of leaf, which, when the caterpillar is hatched, he will at once prefer to eat, except, of course, those you may have in your box, or under your tumbler, and then you will know what to feed them. But, as I said, the best way is to begin with the caterpillars, as you will seldom find the eggs in any other way, or have success in raising such, if you should.

VI. *How to kill a moth or butterfly.* Butterflies and moths having so much vitality, it has been a puzzle how to kill them without injuring the delicate texture of their wings and without pain. A sure and easy way is the following:

Take a glass jar with large mouth and close lid (a candy jar, six inches high and four inches diameter, with glass cover shutting over a rubber band is good), into which put four or five lumps of cyanide of potassium about the size of a hickory-nut. Dissolve enough plaster of Paris in water to cover the cyanide evenly over, forming a hard smooth surface. Put the moth into the jar, close the lid and let it remain five or six hours, after which it can be taken out and mounted.

Have a board (smoothly planed) with a groove the size, in length and width, of the body of the moth. Place it upon the board with the body in the groove; spread the wings evenly, and confine them by strips of paper placed across so as to hold the border of each wing. Take off the papers the next day, and with a pin through the thorax, fasten it to the cork gummed upon the box in which you place it.

“The velvet nap which on his wings doth lie,
The silken down with which his back is dight,
His broad outstretchèd horns, his hairy thighs,
His glistening colors and his glorious eyes.”

—*Spenser.*

I.

BORN IN PRISON.

I AM only a day old! I wonder if every butterfly comes into the world to find such queer things about him? I was born in prison. I can see right through my walls; but I can't find any door. Right below me (for I have climbed up the wall) lies a queer-looking, empty box. It is clear, and a pale green. It is all in one piece, only a little slit in the top. I wonder what came out of it. Close by it there is another green box, long and narrow, but not empty, and no slit in the top. I wonder what is in it. Near it is a smooth, green caterpillar, crawling on the edge of a bit of cabbage-leaf. I'm afraid that bright light has hurt my eyes. It was just outside of my prison wall, and bright as the sun. The first thing I remember, even before my wings had opened wide, or I was half through stretching my feet to see if I could use them in climbing, there was a great eye looking at me. Something round was before it, with a handle. I suppose it was a quizzing-glass to see what I was about. I heard somebody say, "Oh! oh!" twice, just as if they wondered I was here. Then they held the great

bright light close to the wall, till my eyes were dazzled. I don't like this prison. It is n't worth while to fly about. It seems as if I ought to have more room. There must be something inside that green box. It moves! I saw it half tip over then, all of itself. I believe that caterpillar is afraid of it. He creeps off slowly toward the wall. How smooth and green he is! How his rings move when he crawls! Now he has gone up the wall. He has stopped near the roof. How he throws his head from side to side! He is growing broader! He looks just as if he was turning into one of these green boxes! How that box shakes!

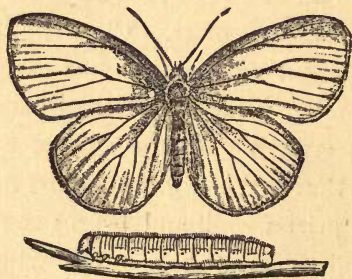


FIG. 2.



FIG. 3.

There, I see it begin to open! There is a slit coming in the back! Something peeps out! A butterfly's head, I declare! Here it comes—two long feelers, two short ones! Four wings, two round spots on each of the upper pair, and

none on the other two. Dressed just like me. I wonder why it hid away in that box?

First Butterfly.—“What made you hide in that green box?”

Second Butterfly.—“What box? I haven’t hid anywhere. I do n’t know what box you mean.”

First Butterfly.—“That one. You just crawled out of it. I saw you.”

Second Butterfly.—“That’s the first I knew of it. There are *two* boxes, just alike. *Both* empty. May be you were hid in the other!”

First Butterfly.—“Ho! There goes up our prison wall! That’s the big hand that held the bright light. How good the air feels! Now for a chance to try our wings! Away we go!”



II.

THE GREEN HOUSE WITH GOLD NAILS.

THERE is a very pretty caterpillar which lives upon the common milk-weed, or *asclepias*, which grows by the roadside, with pinkish clusters of flowers in summer, and curious bird-shaped pods in the fall. This caterpillar (whose name is *Danaïs archippus*—we might call him Archie, for short,) is very pretty, and the butterfly is handsome; but the crowning beauty of all is the chrysalis. It looks like a little green house, put together with gold nails. It is somewhat of the size and shape of a long, delicate pea-green acorn, and has a row of dots half way around what would be the saucer of the acorn, with others about the size of a pin's head on different parts of the chrysalis, and you will say they are not like gold, but are real gold itself.

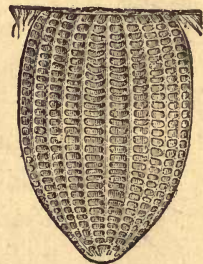
The caterpillar, when full-grown, is about two inches long. It is cylindrical, and handsomely marked, when mature, with narrow alternating bands of black, white, and lemon yellow. These bands are not entirely even, and occasionally run into each other. On the top of the second ring, or segment, are two slender, black, thread-like horns,

and on a hind ring two more, not quite so long as those



FIG. 4.

near the head. You can find it almost any day in July or August, if you look closely, on the under side of the broad ovate-elliptical leaves of the milk-weed. When this caterpillar first leaves its conical, reticulated egg (which is always found on the under side of the leaf, a miniature hanging-basket, first yellow and then gray, as it develops), it is perfectly cylindrical, and of nearly the same size throughout, and only twelve one-hundredths of an inch in length.



AN EGG, MAGNIFIED.

In this, its *first coat*, it is a pale, greenish white, and the horns (front and back)

FIG. 5.

are mere conical points, and it is covered with little black hairs or bristles, from minute warts on the back and sides. The breathing holes, or *stigmata*, show on each side, marked by a plain, narrow band. In the next coat, which it puts on in a few days, the black stripes appear, and also faint lines of white and yellow, and the

horns are longer. The third and last coat (before the final change to the chrysalis) is much the same, except that all the colors are brighter. The horns are shed with the skin, new ones having been formed beneath to take their place. These have been so carefully folded away that at first they scarcely appear; but they are soon developed, or uncurled, and unbend so suddenly as almost to surprise one.



FIG. 6.

When the caterpillar is ready to make its change into the chrysalis, it spins a little tuft or button of silk to the under side of the leaf (or the box-cover, if in prison), into which it fastens its hind legs, by their little hooks, then lets go the hold of its other legs, and hangs, head downward, with the body curved, as in Fig. 6.



FIG. 7.

In this position it remains about twenty-four hours when the marvelous change is wrought—the coat thrown off and the chrysalis developed.

It was the accidental finding of his chrysalis, attached to a spray of wild carrot, that led me to study this particular species. It was a secret to me—this beautiful green and gold house. It held something. What, I must know! Cutting the stem of the carrot, I brought the treasure carefully into the house, covered it with a tumbler, and for a week it remained just the same. Then the green began to turn to a

light purple, and lines began to show through the clear case. The front showed lines like a curtain, parted and folded back each way, like drapery, to the bottom, as shown in Fig. 8. The back was curiously marked off, and looked like Fig. 9. The whole gradually took on a very dark purple hue, and I hoped to see it open and give up its treasure. But though I watched very carefully, it stole a march on me, and one morning I found its secret disclosed and fluttering below the empty chrysalis, now but a clear, rent tissue, with here and there a pale gold dot.



FIG. 8.



FIG. 9.

The butterfly is handsome and quite large (more than three inches across when the wings are spread), but not quite so beautiful as you would infer from his elegant house. He is of a rich tawny orange, bordered with velvety black, on the upper side, and a lighter nankeen yellow below; and has a large velvety black head, spotted with white.

As I did not know how large he would be, nor when he

would come out—for he did not invite me, as I said, to his “opening,”—I had not given him a glass roomy enough for his wings to expand entirely at the first, as they must, or remain imperfect. So afterward, although he had the liberty of the whole room, he walked about with one wing folded back over his shoulder, like a lady’s opera-cloak. But I kept him, and, learning that he came from the milk-weed caterpillar, I went in quest of one. I was fortunate enough to find five in one search—three on one milk-weed, and two on another. I put them in a glass fernery, about one foot long and ten inches high, and fed them with fresh milk-weed leaves daily. Soon they mounted, one after another, to the top, and began to work on the under side of the glass cover, My curiosity was on the alert to see how each would build his green house. I had seen cocoons of various kinds spun. but the glass-smooth chrysalis could not be spun. Oh, no! It was altogether too nice work to be done in sight. There was no sound of hammer or sight of tools. It was all polished and painted and ready—and lo! the inner layers of the caterpillar’s skin had been the work-shop, and the outer skin was taken down and discarded, like worthless scaffolding, when the green and gold house was ready. Pretty soon there were five of these houses hanging from the glass roof, side by side; and now there are five empty homes, still clinging by the little shiny black twist that fastens them firmly to the glass, and five handsome great butterflies, like the one

shown in Fig. 10. Only one of all these did I see break the shell and come out, and that only by the most diligent watching. The butterfly was packed, head downward, at the bottom of the chrysalis—wonderfully packed, as all will admit who see him emerge, to shake himself out into something five or six times as wide, a beautiful uncramped butterfly.



FIG. 10.

After seeing them brighten a bouquet, and watching them eat with their long spiral tongues from a little bed of moss sprinkled with sweetened water, I let them take a nap under a tumbler with a little pillow of chloroformed cotton, and, unmarred even by a pin, they were ready to be laid away in a glass-covered box in their long, dreamless sleep.

It has been said by some entomologist that each plant is visited by about five different insects. This year (1877) I have searched in vain on the milkweed for the large, handsome caterpillar of the *Danaïs archippus*. That there must have been a few, the occasional presence of the *Danaïs* butterfly has proved. Two were seen in Massachusetts, flitting gaily past me as if in mockery of a long and futile search I had just made for the caterpillar among a whole tract of milkweed; one in Brooklyn, and one or two in Pennsylvania, but they were exceedingly rare. The eggs were probably destroyed by spiders and other insects, but why to so much greater extent than the previous year is not so readily explained.

The only caterpillar (and that very abundant) which seems to have lived upon the milkweed this year, and found upon the same spot where the *Danaïs* caterpillars were so readily obtained last year—sometimes half a dozen upon one plant—is a small one in comparison to that of the *Danaïs*, of a soft, woolly appearance, orange-red in color, and about an inch in length, with hairs thickly set in starry clusters about each fleshy ring. Three of these abundant orange-red caterpillars have gone into a shiny-brown chrysalis and come out, after a three weeks' sleep, into lavender-colored moths, perhaps an inch and a half across the expanded wings, the wings edged with a narrow orange border. They were "traveled" caterpillars, going in a box as chrysalids from Pennsylvania to

Massachusetts, coming out there, and traveling back as quietly as if long journeys were a matter of course. A second set of caterpillars of the same kind appeared in August, some of which are now (September) in their chrysalid homes. They made from their woolly, downy hairs (more soft than those of any other caterpillar I have seen) a soft cocoon like loose felt, and these four have gone up in pairs, two chrysalids in each thin cocoon. This little lavender moth is neat and quite pretty, but not to be compared for beauty to the *Danaïs archippus*.



III.

TWO FRONT DOORS, AND WHAT WAS BEHIND THEM.

A BUTTERFLY in March! Velvety black, with wings bordered with a double row of yellow spots, and the hinder wings tailed, having also the added ornament of seven blue spots (a nebula of dotted blue points, with a frosted silvery sheen making each spot). He is the *Papilio asterias*. You have seen him in May, June, or July, hovering over a bed of phlox or other sweet flowers; but unless you caught him "in the bud," or, of course, when a caterpillar, you would not have him in middle March.



FIG. 11.
CATERPILLAR.

The sole occupant of a glass fernery, sipping from sugar-sprinkled moss with his long, uncoiled tongue, he seems quite at home, and sees nothing of the snow now whitening every branch and tiny shrub—knows nothing of the

"April-fool," which, as Susan Coolidge says, spring throws to the flowers outside—the daring crocus and daffodil. With his moss, and some fresh snowdrops in a vase, standing in his glass house for dessert—an extra drop of sweetened water in their pure cups—he is monarch of his little world.



FIG. 12.

As a caterpillar, he was handsome. At first a tiny black caterpillar, with a white stripe running through the center of the body and across the tail, and covered with some small black dots or points. The next coat has but one white stripe across the middle, on the sixth and seventh rings, with orange spots beneath the black points, two white spots on his first ring, and a row of white spots on each side. Then at last he has a rich coat, striped with

black and dark green, and ornamented with deep yellow spots. But his chrysalis is quite plain, with nothing of the exquisite beauty of the green and gold house of the Danaïs. But when he leaves his shell, coming out by the narrowest possible front door, so that you must look sharp to see the thread-like opening, then he is much handsomer than the Danaïs butterfly. So, many people, living in plain tabernacles, and sometimes regarded homely by others, have something within, waiting to give great surprise, when they shall have escaped, through a narrow door, into a world of wonderful light and beauty!

The *Papilio asterias* is very fond, in his caterpillar form, of the wild carrot, or garden carrot, parsley, or celery, and any of the warm, aromatic plants, as anise, caraway, and dill.

This March butterfly, as a caterpillar, was eating his delicate carrot leaves and seeds last September at the same time with the Danaïs caterpillar, and as we brought them fresh leaves, day after day, and watched them go into their queer little houses at the same time, we did not know then but they would have their "opening" also, together. But while the Danaïs was ready to come out in a fortnight, or three weeks, the *Asterias* slept on until March—six months under his glass roof, without moving a hair's breadth, until he was out trying his new wings, yesterday morning. Some other kinds of chrysalids have kept him

company all this time, except that they have moved a little, and sometimes a good deal (when touched with a pencil, or slightly blown upon), showing the life within; but not a particle—watch him never so closely—moves the *Asterias*. There were six chrysalids of this one kind under separate glasses; all of which were taken as caterpillars, and each of which I had watched go into his separate house. It is not a

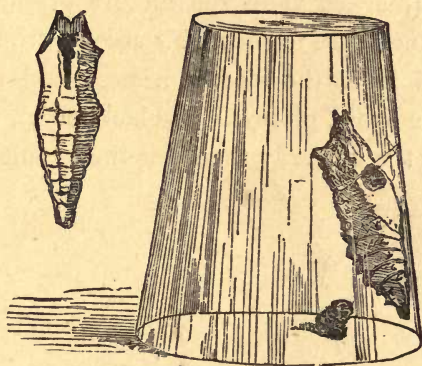


FIG. 13.

cocoon, woven as some are of his own hairs, or spun from some hidden substance through a spinneret; but like the *Danaïds*' it is formed under the caterpillar skin, and when he is suspended as a caterpillar, with a silken thread holding him about the body, as shown in the picture, he drops off the entire skin, and it remains, as seen, beside his chrysalis, which is pale and nondescript in color, knobbed with many little round

protuberances, giving it a curious rather than pretty appearance. When one was out, the next thing was to look at the others, when lo! a most surprising revelation! Another chrysalis was empty, but the *front door* was very different! Instead of a crack, a thread wide and half an inch long, in the upper part of the back (the narrow black line in the chrysalis shows the butterfly's door), there was in the side (marked O in the picture of the chrysalis, and only belonging there to show this second front door) a perfectly round hole, the size of a pea; and trying his new wings (four narrow, glossy, blue-black ones), was something more unlike the butterfly than was the circular door he came



FIG. 14.

out of unlike the narrow door of the *Asterias*. Looking something like a saw-fly, and more like a wasp, it was a large ichneumon fly. The parent ichneumon, having stung the caterpillar and deposited the egg, the ichneumon was safe in his provided chrysalis home, when he woke up to a sense

of his privileges, and not only appropriated the house of the *Asterias*, but literally lived on the occupant, eating him up and then making his own way into the world, leaving the chrysalis entirely empty, and quite whole, with the exception of the round door. His head and slender body, antennæ, and six feet, are all an ochre yellow. The eyes are large, jetty black, and oval-shaped, and back of them, on the top of the head, are three round, black beads, in a triangular position. His body is joined to his head and shoulders by a pedicel, so long and slender that he is able to work from it like a pivot, in all directions, giving as fine specimens of gymnastic operations as one often sees.

His veined, clear wings, are exquisitely glossy, and he polishes their steel blue till it burns like a mirror. He has the vanity of a Beau Brummel, judging by the great pains he hourly takes with his entire toilet. Grasping both his long trembling antennæ at once, and smoothing them out again, as a philosopher would stroke his beard, nothing is left on one of their thirty-five segments large enough for a microscope to reveal. Then his wings and six legs go through the same operation, and he is ready for a fresh supply of sugared sweets. But alas, his mouth! If he had claim to beauty in every other particular, one good look at this remarkable feature in a mirror would secure his humility for ever. An hour's close study with the microscope reveals no trace of beauty about it! The most curious transformations do no good in re-

deeming its unmistakable homeliness. There are three projections from it—impossible to describe—two seem like short, curved legs, with which it clasps its throat, and the center is a curved affair something like the letter V. It is very much like the mouth of a wasp, but in such constant motion that one can not guess at its exact shape or manner of manipulation.

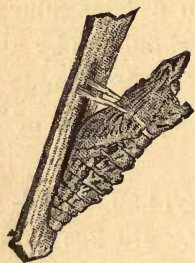


FIG. 15.

It is well that it is so small that it does not detract from his looks except with the use of a microscope—and so long as he does not know it himself we will allow his vanity to be pardonable.

One such parasite will, however, satisfy us, and we hope only the *narrow* front door will open for the rest of the *Asterias* chrysalids.



IV.

THE EARLY BUTTERFLY.

WALKING up a rocky lane one warm day in the latter part of winter, my attention was called to a large, sombre-looking butterfly, lying flat upon a rock. Any sort of butterfly, so out of season, was worthy of notice, and, as this one was very quiet, as if half asleep, I easily took him up and carried him home with me. He was handsomer upon inspection than



FIG. 16.
THE EARLY BUTTERFLY.

at first sight I had imagined. The wings, though grave in color, were really a rich purple brown, with a broad margin of light yellow or buff, and six or seven spots of a lavender color inside of the border on all the wings. He had a queer, pinched-looking head, with sharp features, and furry front feet. I did not know his name, and as he was very restless, and beat constantly against his prison wall, I gave him his liberty. Some months after, on June 5th, of the same year, I found on a shrub, in the same rocky lane, a very formidable looking spine-covered caterpillar.

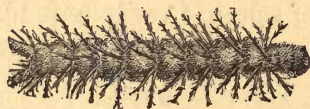


FIG. 17.

He was black, but dotted with minute irregular white spots, like tiny snow-flakes. There was a broad black line running down the back, interrupted by eight spots of brick red. Each side, also, was dotted with white spots. There were seven rows of large spines, besides a row of very small but similar ones low down, just over the feet. Each of the two center spines on the ten rings were branched, as also the two on the last ring. As these spines were stiff and sharp, and did not lie particularly close to his body, he was treated in a very cautious manner until safe in his glass prison, al-

though I have been told that these caterpillars, and in fact nearly all caterpillars, however formidable they may look, are in fact harmless. The fiercest one I have ever seen, that of the regal walnut moth (*Ceratocampa regalis*), very large, and with long horny spines stretched over the head, which when disturbed he shakes in a threatening manner, is said to be perfectly harmless. One would certainly prefer to test this harmlessness when he had thrown off his horns, and, after a smooth, chrysalis life, come out into the beautiful walnut moth.

The caterpillar I had imprisoned did not at first like his confinement at all, and showed a most worthy persistency in attempts to solve the possibilities of escape, walking with entire contempt over the fresh leaves of the willow from which he was taken (and any species of which he will eat), going up and down and across to every corner and joint of the box, until, at last, apparently satisfied that he was secure in his new abode, he as wisely accepted the situation and began such a marvelous course of eating as showed that he had determined, if he must be a prisoner, not to commit suicide by starvation. Leaf after leaf disappeared and new ones were supplied, until, at length, he suddenly stopped eating, and began to weave a little thread and fasten himself securely at right angles with the side of the box, much in the same way as the Danais caterpillar. His head is round, large, and flat on the top, resembling the old-fashioned velvet "jockey

cap." There is no red spot on the first two rings from the head, but on all the rest; each spot, on close examination, being made of three spots close together in the form of a triangle, in this manner \therefore . Nothing could be much meeker, or in greater contrast to his first eager restlessness and snapishness, than his appearance after he has fastened himself by his hind feet firmly to the glass, with his head downward and bowed forward touching the glass, only a slight movement of the head now and then showing that he is alive. His three pairs of true feet he draws close together like a wedge, in short, spasmodic movements, and then slowly opens them again. At last, after a day or more of this suspension, he throws off the caterpillar skin and shakes himself into a brownish chrysalis, which operation takes but a few seconds after it has begun. But the chrysalis, which at first is soft and misshapen, has to assume its characteristic form, which it does by contracting and expanding and throwing out a protuberance, until, in about an hour, it has its shape, and its surface becomes hardened and the chrysalis com-



FIG. 18. plete.

This was on the 6th of June, and on the 18th day of the same month the chrysalis opened, and lo! there was my early winter butterfly, the *Vanessa antiopa*. This one was much fresher and prettier than the one found in February, and this I could well account for when I learned that this

butterfly lives often all winter, hiding in some sheltered spot, stupid and almost dormant, but ready for the first sunny day, sometimes enticed from its hiding-place before the snow is quite gone, its wings somewhat worn and faded by its winter's experience. Since then I know it as the earliest butterfly, and am not surprised to see it early in February heralding the spring far in advance of any other.



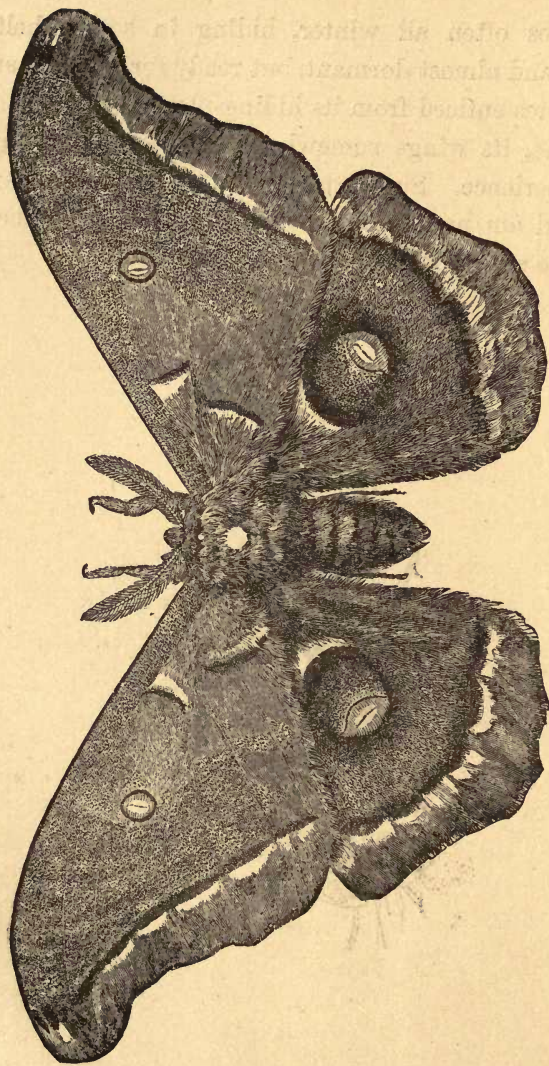


FIG. 19.

THE POLYPHEMUS MOTH.

V.

THROUGH A GLASS CLEARLY.

WE do not like to see a beautiful thing at a disadvantage. When a large cocoon (yellowish-brown, and leaf enwrapped), cut from a spray of wild raspberry, in September, had been watched for over six months, and showed no signs of life within, it was half given up as a useless affair. Inquiring



FIG. 20.

scissors, one day in March, stole an entrance into the cocoon by carefully snipping one end, and cutting spirally round an opening which revealed, unharmed, the living chrysalis within. It seemed certain—secret as it then was—that

from out this brown-ringed casket some beautiful thing was preparing to emerge.



FIG. 21.



FIG. 22.

While watching it closely, a month later, one of the vest-like folds on the breast slowly began to part, revealing, first, a curious bridge of fringe across the opening. What could this be? The side of the clear-glass box, even, was too much obstruction for the impatient watcher. "I can not look at this through a glass darkly," I said, as the

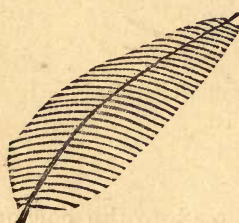


FIG. 23.

lid was removed; and slowly out came this amber fringe, a broad, beautiful antenna, yellow stemmed from base to tip, with ochre-yellow fibers radiating from it in a perfect plume. The other soon followed. So large, so full, so beautiful antennæ I had not seen before.

Now for the microscope. Ah, the difference between an obstructing and a revealing glass! Between seeing through

a glass darkly and through a glass clearly ! A richly-colored center stem, of thirty-one joints, and two filaments to each joint, of exquisite finish and symmetry. Then a little wider parting of the vest (no breaking of the chrysalis), now and then a shiver and a spasmodic movement of the whole chrysalis, with a little further exit—another shiver, another waiting, and in an hour and a half out came a beautiful (but still limp and contracted) Polyphemus moth.

A pot of hepatica stood ready in the box for him to cling to while expanding his wings, but the slight, fresh stems proving too frail for his weight, the danger of a fall was prevented by putting a stick into the earth beside the hepatica, to which he immediately clung, and gently unfolded his soft-hued ochre wings, bordered with gray, showing two large and elegant eye-spots on the hinder ones, of a deep blue-black, with a transparent oval in them, clear as a bit of inserted mica. In the upper wings were two smaller transparent ovals ; a collar, edged with lake color, and two spots of lake-red, edged with black on the edge of the upper wings, completed his beauty. The body, of a soft brown ochre, was furry and feathery as an owl. Large eyes, six short furry dark-brown legs, a softness of blending in color, and a gentleness and grace of motion crowned the whole. Lifting his large wings, his flight was slow and graceful ; no hurried fluttering and wild beating against the glass when a prisoner ; no dashing about the room when at liberty.

If ever a name was a misnomer, it is surely so in his case. Polyphemus, a one-eyed furious giant, a murderer and greedy cannibal, for him to give a name to this two-eyed, gentle-natured and apparently tongueless moth (whom no sweets could tempt), simply because it is large! As well might he be called the Tower of Babel, Behemoth, Leviathan, or any other great thing of earth or sea. He is, however, not likely himself to apply to the legislature for redress for this grievance.

The inside of this cocoon is finished with the hardness and smoothness of the inside of an almond shell, which it closely resembles, except being much larger.

The larva of this moth is described as of a bluish-green color, with a yellowish-brown head, living upon the oak, elm, and lime trees; the cast-off skin was inclosed in this cocoon. The disposition of the eye-spotted ochre was well tested in the artist's saloon. No philosopher ever showed more patience and dignity under repeated trials at the hands of a photographer than he displayed in the hands of his persecutors, with no knowledge of the cause to stimulate his vanity and inspire his courage.

I said the mystery wrapped up in the brown cocoon was "a secret." In studying Natural History we often learn the first part of a lesson last; sometimes the middle part first; sometimes it is years after we get part first before we can find part second, even of a short, small lesson. The pages of nature's

book are countless, but they are not all numbered, and sometimes we have to stop and wait in a most interesting place. It is all the pleasanter when we complete the round. After the Polyphemus moth had been mounted for months, a beautiful caterpillar was given to me. He was very large; of a handsome pea-green color, with little points of golden yellow, which, in certain lights, had a beautiful pearly appearance, like frosted silver. There were five or six of these points on each ring. The feet and the head were a light brown, almost exactly the color of an almond shell, and the green V-shaped tail was bordered with a line of darker brown.

He was given to me one afternoon in August, just as I was about to go out for a walk. After admiring him, and noticing carefully his colors and peculiar shape, I said, "I will sketch him, on my return." But there are some things which do not wait upon our leisure, and a caterpillar, just ready to retire to private life, is one. So, when I returned to him, two hours after, the only way he could be sketched was with his head and three or four front rings peering out from a well-begun cocoon. He had already attached the leaf (it was a maple, as he was found near a maple tree) to the side of the glass box, and drawn it about him partially, and was working very busily.

My disappointment in his special hurry was relieved, however, by finding, a few days later, and in quite a different

locality, another caterpillar of the same kind, which is now before me, clinging to a spray of oak leaves, eating and resting as he chooses, with a sort of elegant leisure. Turning away from a maple leaf, he shows his preference for the oak; clasping the stem of the leaves firmly with his ten false feet, he moves his brown head silently back and forth, while the leaf melts away before him very steadily. He has the

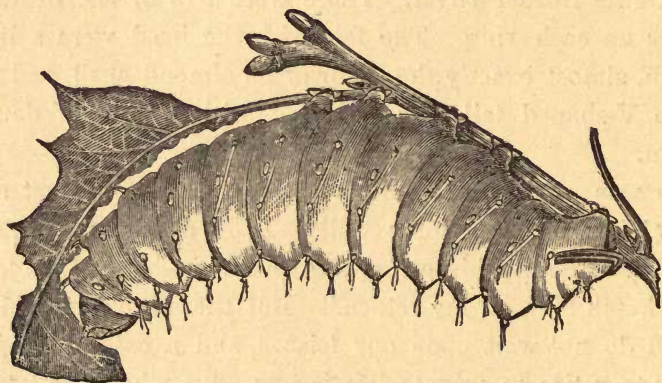


FIG. 24.

same disposition manifested by the Polyphemus moth, which he anticipates. He never jerks about, when disturbed, or shows the slightest irritation, as do many of the caterpillars, and is so quiet in every movement that you feel sure he is well contented with life as he finds it, with no regrets for the past or speculations about the future. A perfect contrast to him is the little, jerky, impatient caterpillar of the quince,

in a box beside him, who, if touched the most lightly, will actually spring up and throw himself entirely over, in the most astonishing manner. Between these extremes, every variety of disposition prevails among them. When at full length, this Polyphemus caterpillar is about three inches long; but when hunched up like a half-closed Chinese lantern—as he now lies, eating his oak leaf—he seems but little over an inch in length.

The edge of the first ring, which comes close round, like a hood, over the brown head, is light lemon yellow, and the upper or second joint of the true feet, and a narrow border above the brown feet, are also yellow. The diagonal side stripes are yellow, also; the spiracles—forming a dash near the center of each diagonal line—are a lake-colored brown. Each one of the diagonal lines is finished at either end with a round orange or gold-colored knob (like the old-fashioned “frog button”), with a single white bristle in each.

This marvelous detail of finish in even the smallest insect excites our constant wonder and admiration.

The cocoon spun so suddenly by the first of these two caterpillars is exactly like the one cut from the wild raspberry, except that the color is a lighter yellow. The leaves are drawn over it in the same manner, and firmly glued to the cocoon. The mystery which this had seemed before was solved, by witnessing him make the cocoon, just as you would better understand the Chinese ball within a ball after

seeing one cut. He first bent the leaf in the position required, drawing it up at the end, and lapping it over at the side. Then he spun the fine, creamy threads of silk, weaving back and forth very dexterously, connecting the opening of the leaves with the side of the box. Contracting his body more than one-half within this leafy outline, he worked himself adroitly into positions to form its symmetrical outline. I watched his work until very late in the evening, and the next morning further watching was useless. He had "wrapped the drapery of his couch about him, and lain down to pleasant dreams."

More than six months he slept in his cocoon; and now in April, 1878, he is a handsome Polyphemus moth. Very curiously, he came out just *one day later* than the one last year from the wild raspberry. That was on April 19th, and this came out April 20th. This moth is not quite so bright as the male one, and the antennæ are not so large and plume-like; but otherwise it is equally handsome. The second of the two caterpillars, as it spun up a little later, is not yet out, but the *cocoon* has been peered into, and the chrysalis, in the increasing clearness of its rings, and its active movements when disturbed, gives promise of an early exit. There is no danger of injuring the moth by carefully opening the cocoon which holds the chrysalis, and then its change can be watched as it turns from a dark brown to a lighter shade, and becomes almost transparent before it opens. Since writing the above,

a friend sent me from another state, a box with a note—which was read before opening the box—which said, two handsome caterpillars would be found in the box. On trying to remove the lid, I found something was the matter; when lo, instead of what was promised me, two large, scarcely completed cocoons! My disappointment would have been greater had I not known them at once as belonging to the *Polyphemus* moth. They were busy travelers, building as they went, and in one short journey completing a house, with a speed and perfection of finish which puts greater architects to shame.



VI.

HOW I CAUGHT A BEAR.

I WAS walking quite alone, when a slight noise attracted my attention. I looked about me, when, close at hand, and deliberately advancing toward me, I saw—a bear.

I was not in the least alarmed, which proves how much there is in a *name*, for I did not then know he was a bear.

Determined to capture him, I armed myself with a small twig and a very small cage in the shape of a tumbler.

Instead of resisting, he coiled up quickly into a ball, was tipped into the cage, and this soon inverted over a piece of white paper on a book.

Thinking a leaf might attract him, I put a bit of cabbage leaf under the glass, and soon he was forgetful of his im-

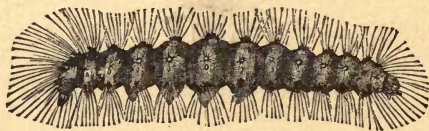


FIG. 25.

prisonment in satisfying what proved to be an almost insatiable appetite.

He spent his time for some days in devouring leaves and taking 'exercise by rapidly traveling about his small prison.

Eat, march, eat, march, was his programme, until, not satisfied with one den, he made himself another, and having sealed himself in, I saw him as he was no more. I afterward found that inside of the second den he formed another. His winter quarters were secure.

This was in September. He slept undisturbed until March, and then he began to go about again quite freely, but in a new coat. He ate, too, but very delicately. Not leaves, but a dainty sip of honeyed sweets. In September he was a yellow-bear caterpillar. In March he was an ermine moth.



FIG. 26.



FIG. 27.

A white miller, we should say, but when we part his wings we see his body is yellow striped lengthwise, and alternating with each stripe has a row of black dots. And on his wings there is the merest point of a black dot (one on each fore wing, and two on the hinder ones), so very small that you would not at first notice them. But they belong to him, and are always there. For he is not the only

bear we have watched through this change, and four or five quiet, dreamy, pointed, black-dotted moths are now in a box close by me, all alike, except a little different in size.



FIG. 28.

These are the Virginia ermine moths.

In the same box are some many-spotted ermine moths, something like leopard moths; but whether tiger, bear, or leopard, the name is not derived from the nature, as all are quite meek, and much more like a lamb.

There is one of these white millers beside me now as I write. The same tiny speck on each fore wing, the same two dots on the hinder wing. He, too, went into his den in September, and came out in March (1879), so white and furry about the head that if as a caterpillar he should be called a yellow bear, as a moth I should call him a polar bear.

VII.

CRUMPLE-WING.



FIG. 29.

CRUMPLE-WING came out of his winter's sleep in March. He went in in September. He was a salt-marsh caterpillar

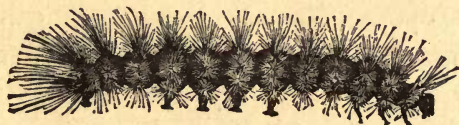


FIG. 30.

(the *Arctia acreea*). But he seemed very much at home in an inland garden. He was on the croquet ground, plodding his

way among rolling balls and quick footsteps, when he was made a prisoner.

He lived on grass, plantain and other leaves, until he wove his yellowish-brown hairy cocoon under his glass tumbler.

I do n't know why he came out of his long rest with a crumpled wing. I think he had plenty of room under his glass, and no one touched him before he was perfectly free and walking about in his queer one-sided manner. When a *Danaïd* butterfly, on coming out of his chrysalis last summer, exhibited a marred and crumpled wing, I knew it was because he had been confined in too small a space for his wings to expand fully; and the form of the pupa itself had been compressed by the position in which it was formed, so as to resemble in shape half an acorn-cup rather than a whole acorn, which it looks a good deal like when perfect. Another *Danaïd* had its wing marred by touching it very gently with a pencil's point, in the eagerness to see it expand more quickly. The slightest touch at that time will injure this delicate fabric, than which nothing in nature seems more susceptible of harm. But there was, no doubt, a hidden reason for *Crumple-wing's* misfortune, at whatever time it occurred. His right wings are perfect and quite handsome. The hinder left wing but half unrolled, and much shriveled. The hinder wings are a rich ocher-yellow; the front pair white, dotted with black, and ocher-lined. His back is ocher-yellow, with seven black spots down its center; six on the

yellow, and one on the last ring of the body, which is white. Two rows of black spots ornament the sides, and there is one on the under side of the body also. His antennæ are long and graceful, and the microscope shows them to be variegated in color, and with spiky hairs, instead of being feathered. His head and neck-cape are tinged with ocher. At first he appeared so indifferent to food that it seemed doubtful whether he *had* a tongue; and after being tempted in vain with sugared water, he was left some days to work out the question without it. But when next offered a chance to break his fast, it was amusing to see how eagerly he thrust out his short, amber-colored tongue and drew up the sweets, as a child would sip lemonade with a straw. After his long fast, before eating, he had strength enough to tow another moth and two empty cocoons (which chanced to be caught together near him) all about his box, having entangled the claw of his foot in the loose hair of the empty chrysalis cover. One or two dead moths were placed purposely near him. He walked slowly about them, looking at them with the appearance of an anxious doctor or surgeon, studying the case for a time, and then walking off, evidently satisfied that hope was gone when no sign of life could be perceived. It never seemed to occur to him to attend to his own case, which was, however, well enough, as it would have required as much skill to unroll his shriveled wing into symmetry as to put into their dead forms a new life. Just as he stands now,

with his head and left wing hidden under a leaf of the blooming hepatica, you would never think of calling him Crumple-wing. His best foot is foremost. He is a fine looking Acrea.



FIG. 31.

VIII.

UNDER THE CAPE.

THE very day Crumple-wing gave up trying to inspect others, or hold on to his own life any longer, another *Arctia acrea* came out. His brown cocoon was larger than Crumple-wing's. In fact so much larger than any one of the kind I had been watching, that a very fine specimen was looked for from it. As other *Acreas* had appeared, who went in about the same time, he was daily expected, and a hope (which rather grows less as moths increase in number), was indulged that his *exit* might be witnessed. A slight appearance of a disturbance at one end of the cocoon had been noticed, and he was closely watched. Just as the tea bell rang another look was given to his glass box; when lo! there was a small oval opening in one end of the cocoon, and the moth was rapidly advancing up the side of the box to the top. But worse than Crumple-wing! Except that he was symmetrical, his yellow, black-dotted body was only partially covered by a very short white cape, and two pairs of very short wings, looking like the old-fashioned double-cloak capes, without the cloak.



Watching him for a little, with a curious mixture of wonder and pity, we left him; when lo! on returning in half an hour he was all right—as perfect and handsome a specimen of the white-winged *Acrea* as could be found. His cloak had only been packed under his cape. And this is the way he looked before he shook it out.

FIG. 31½. If another caped moth is seen before he has shaken out his entire garment, something more than a tea bell will be needed to prevent a careful watching of the process. There was nothing of the limp appearance of a new butterfly, to suggest any further development of wings as necessary. His *cape* was snowy and full and downy, and he walked off with the buoyancy and strength of a fully developed and perfectly dressed creature. The black dots upon his wings are more exactly symmetrical than in any of this kind before noticed. By actual count almost precisely equal in number, as well as alike in shape and size. The color under the throat is a rich orange, and also of the thighs; the legs being five jointed, alternating in black and white. The joints resemble the divisions in the stems of rushes, as is the case with those of most moths when examined with the microscope. The last joint terminates in a sharp, black claw, with which he can cling with a force not to be overcome without danger of breaking. His antennæ are spiked, instead of feathered; and if Crumple-wing is an *Arctia*, as we have

supposed, and he seems to answer the description of that moth exactly, this is one of the same class, without the ocher-lined front and the ocher hinder wings. When at rest his wings are roofed or sloped downward, covering the yellow spotted body entirely.



FIG. 32.

IX.

THE ARCTIAN AND ICHNEUMON.

THERE were still two chrysalids of the Arctian left, and two days after the one had stolen out from under his double cape (all moths and butterflies have the double-cape appearance), one of these chrysalids was seen slowly ascending the glass prison wall, piloted by the head and forelegs of an ash-colored moth, creeping slowly along with his heavy brown house on his back !

It was another Arctia, or "false ermine moth," as those of this gray color are sometimes called. After a little while the chrysalis fell, and the moth was free ; but, as he had "jarred in the gate" (from not being able from some reason to throw off the chrysalis so soon as he ought), his wings were somewhat cramped, and he looked like a second cousin to Crumple-wing.

After a supper of sweetened water, and upon the lighting of the gas (which always puts fresh life into every fiber of a moth), he shook out his wings very respectably, and showed his appreciation of light as the first object in life. He was of a soft glossy ash color, and his body had three rows of black dots running lengthwise down the center and sides.

It is no slander to say that he was double-tongued, which, however much to be deprecated in human beings, is really nothing against one who uses his tongue only to gather sweets.

While some of the larger moths seem to have no tongue, the Arctians are usually supplied with two. They are coiled up side by side, sometimes joined together lengthwise, and sometimes quite separate.

The last remaining chrysalis was just like the one of the ash-colored moth, but when it opened, instead of the expected Arctian, out came a large slender-bodied Ichneumon fly! his head bright yellow and his legs alternating with honey-yellow and black. His wings are a brilliant steel blue. He resembles the Ichneumon that came out of the "round" front door of the Asterias, but is larger, and has a sword-shaped borer nearly half an inch in length, giving him rather a formidable appearance, as he comes buzzing in his "April fool!" with a bold whirr, instead of stealing in softly with the meekness of the feather-winged Arctian.



X.

THE WHITE ERMINE MOTH.

I FOUND him one November day,
A stiffened circlet at my feet,
And made him prisoner in my room,—
His brown coat glistening with the sleet;

Awhile he lay as still and stiff,
As though his little life were o'er,
Then yielding to the new-found warmth,
Shook off the icy pearls he wore,

Surveyed awhile his crystal walls,
Shut in from liberty and—cold;
Then built an inner prison wall,
Closely his body to enfold.

He seemed to sleep an endless sleep,
Silent and still so long he lay,
When lo! in robes of snowy white
He sprang to life one winter's day!

XI.

A HUNDRED TO ONE.



FIG. 33.

WE had been looking in vain for caterpillars on grape-vine, walnut, and sycamore, when we stopped before a large woodbine, which threw its clusters over the side of my friend's piazza, in Pittsfield, Mass. We sent our eyes upon a voyage of discovery, and peering among the thick matted mass of green—

“Oh, here is a fine fellow,” exclaimed Teddy, the eager little boy being the first to discover a pale green caterpillar, so nearly the color of the vine that the similarity was his greatest protection.

"Here is another, and another! They seem to be out in force to-day; but these are so high up—how shall I reach them?"

"I'll get a step ladder," said Teddy; and disappearing behind the corner of the piazza, he soon came back tugging the heavy steps, and placed them under the woodbine. Now for some tumblers. They were soon brought, and the caterpillars imprisoned before they knew it, eating on the leaf which had been clipped from the vine without even disturbing their dinner. It was well we secured as many as we did, or even one moth might not have repaid us; for the caterpillar of the woodbine, in common with many others, has a secret little enemy, from which he is not apt to escape. These nice looking ones with such good appetites, however, did not seem to have any lurking danger. But one can not always tell. Damocles was not the only one over whose head hung a sword while he was enjoying his repast. Teddy selected two of the best—not to keep himself—but for the friend who was helping him hunt them. The caterpillars were soon separated; Teddy's remaining where they were found, and the two others going a long journey. Pretty soon some strange things appeared on Teddy's caterpillar. He ate on, but looked rather dispirited, as if he had caught a glimpse of the hair by which the fatal sword was suspended. Soon he was walking about with something all over his back, which made him look as if he had taken a bath, and then

rolled about in a box of rice! The microscope showed these rice grains to be perfect cocoons, white and silky, and each



FIG. 34.

looking as if a little cover were fitted to one end. Something moves inside of these. Some of the little intruders are still working on the inside of their rice-houses, polishing the ceiling and giving the finishing touch to the walls.

By and by they are completed, and then the woodbine caterpillar begins to grow weaker. After a week or two, these little covers begin to fly open, and as they lie back on their hinges, out of each one creeps a small fly, and begins to go up the glass.

He is a prisoner, and we can study him. He is one of our old friends, a species of *Ichneumon*, with ugly mouth, jointed antennæ, hooked feet, amber legs, and thin, narrow wings. He is very small—but there are so many! The poor caterpillar can not stand it. A hundred to one is too much, and by the time that over one hundred of these swords have pierced his body, he was, as Teddy's grandmother said, "very dead." Here is his likeness, which an



FIG. 35.

artist took for Teddy's friend. You can only see his head, one or two wings, and one foot.



FIG. 36.

But the two caterpillars which took the journey seemed to escape this trouble. They both soon went into chrysalids. One drew a leaf about him, and fastened it with a few glossy hair lines to the bottom of the glass; the other made a hint of a cocoon, with a thin network of gauze-spun threads, and twenty days after came out a pretty moth—the forewings olive gray, banded and shaded with olive green, and the hind wings a reddish brick or rust color. Both pairs of wings were uniquely scalloped. The chrysalids were, first a sort of mulberry color, irregularly spotted here and there, and the one which opened, growing brown (and a very dark

brown between some of the center rings), just before coming out. The second chrysalis, formed some days later, is brown and dark-ringed; but as it is a fortnight since the moth made his appearance, he is taking it very leisurely, if he appear at all. This caterpillar and moth answer



FIG. 36½.

to the description given by Harris of the *Choerocampa*, or hog caterpillar (which seems as great a misnomer as that of the *Polyphemus*), from a fancied resemblance of the head to that animal—the head of the caterpillar being small, and the fourth and fifth rings very large, and tapering to the small head.

The moth has been named *Pampinatrix*, from its living on the shoots of the vine. The caterpillar lives upon the grape, as well as the woodbine. In Harris' description, it is said that the moth leaves the chrysalis "in the month of July, of the following year." But this (as most other moths) has an opportunity of trying the world twice in the course of a year. Some very large caterpillars—four inches in length, and as large as one's finger or thumb—closely resembling the *Choerocampa* in shape, have since been found on a woodbine in Pennsylvania. They were, however, so completely covered with the "rice houses" (more than a hundred to one) that they were not kept. Only, the parasites were brushed from one into a box, and now the "syrup cups" are opening, and a perfect colony of *Ichneumons* are running up and down the glass, wondering how they came to be born in prison.

XII.

THE UNFINISHED LIFE OF QUAKER GRAY.

I HAD a little Quaker, dressed
In starry robe of gray,
With silken tufts of black and white
Completing his array.

His home was on a Quaker leaf,
A poplar, silver-lined ;
On this he lived, from this he ate,
Beneath my glass confined.

If frightened, he would drop the fringe
Of tufted black and white,
Putting his jetty, varnished head
Completely out of sight.

One day, when he grew very tired—
Tired of his poplar leaf,
Tired of his small glass prison and
His little life, so brief,

He climbed his crystal wall, and wove,
In silence all the day,
A Quaker hammock for himself,
Of tissue silvery gray ;

Wove it about his bead-like head,
About his feet, so queer—
Ten feet behind, like amber spools,
So yellow and so clear,

And six in front, like tiny horns—
So, fastened in his net,
Day after day, as still as death,
Hung the poor Quaker pet.

One morning, slowly out he crept,
And a fresh suit he wore,
But to my disappointment, just
Like what he had before.

Perhaps a little longer waved
His tufts of black and white,
Perhaps a little glossier grew
His silvery coat, so bright.

Weeks passed; a closer net he wove,
Again of sober gray,
And, self-immured, profoundly slept
His second life away.

More than a year for coming wings
I watched that tight-locked cell.
Still closed remains his prison door,
And now I know full well
That this short tale of Quaker Gray
Is all that I can tell!



XIII.

AN EARLY CECROPIAN.



FIG. 37.

Two rough brown oval cocoons, spun (with one flat surface fastened lengthwise to a branch) by the large green caterpillar of the *Attacus cecropia* moth, were brought in, and lying side by side, looked as nearly alike as possible. From one of them, on March 1st, as if to show his appreciation of spring, the fine Cecropian stole out which is now in the glass before me. The other cocoon, from eagerness to see what promise it gave of a mate, was carefully cut at one end; when lo, an empty chrysalis within! Even with a microscope



FIG. 38.

no place of exit was to be discerned. But his cast-off dress was in the tomb, and it was evident he had with more skill and silence than the vanishing Arab, gone off without his tent, to enjoy the freedom he could not have had, had he been born in prison. I could easily believe the remark of Harris, as I searched in vain for the "front door," that the threads of the cocoon of this moth "converge again by their own elasticity, so as almost entirely to close the opening after the insect has escaped." In fact, I could omit the "almost." The change is indeed marvelous from the large, light green and coral-dotted caterpillar (making one think of a cactus stem that had concluded to walk off), to the gray, white, and cinnamon-brown moth (fig. 39). The six legs and most of the body are cinnamon red. The broad, brown antennæ, with central amber stem, come out from the front of the rather small cinnamon-colored head. Just back of this a neat white collar, and then the tufty brown extends back half an inch, and from it proceed the wings. Then comes a narrow band of lead color, and the rest of the body is ringed with black, white, and cinnamon red, alternating. Along each side are seven round cinnamon-red spots, bordered with white. The finish of the hinder wings, in heavy lines of alternate gray and black, remind one of pheasant's wings; but above this border is a line of the red, and above that, a narrow line of white. In the rich, furry grayish-brown of the hind wings are two large crescents of red and white. The front wings

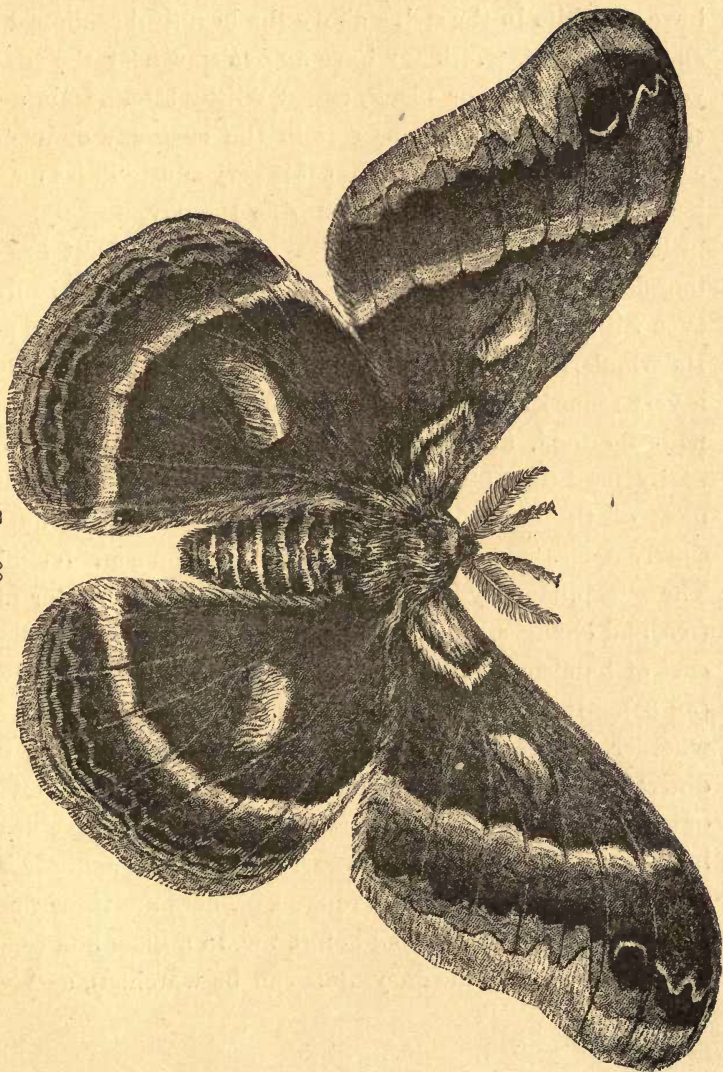


FIG. 39.

THE ATTACUS CECROPIA MOTH.

have no white in the stripe above the beautiful scalloped gray and reddish-white. They have an eye spot near the edge of very dark brown or black, edged with white. It is a very rich moth, though not as soft in the harmony of its colors as the *Polyphemus*. Like that it is very gentle in its manner, keeping almost entirely quiet during the day, and flying but little in the evening. Its eyes are black. If it has any tongue it is not to be seen, at least while the moth is living, even with a microscope; nor can the moth be tempted to use it. Its wonderful tenacity of life, when this fact is considered, is very remarkable. It will live about three weeks apparently with no food, and pays slight attention to any thing ordinarily used in putting moths to sleep! This moth stands most of the day with its wings almost together, but will slowly open them to their full extent if blown upon slightly. The caterpillar may be found upon the apple, cherry, or plum-tree, and changes, from being at first a deep yellow, to its last coat of handsome light green, before going into its chrysalis (fig 35). It is said by Harris to come out in June, but, whether on account of the very mild winter and the usual difference of climate between Massachusetts and Pennsylvania, or as a surprise to insect lovers, this *Cecropia* is three months in advance of that season. So early an exit will make less difference to a moth without a tongue. There are three fine cocoons of the *Attacus cecropia* before me, in a glass box (opened at one side so that the chrysalids can be watched), as I write

(March 29, 1879), and by the transparent lines between the rings, one of them shows it will soon release its impatient prisoner. The Cecropia worm spins its cocoon invariably alongside a twig or branch, as shown in the cut, when in the orchard or wood. But one of these three (the caterpillar of which was confined in a glass jar) made his cocoon of the usual shape and texture, except that the material is a richer glossier brown, but it is not attached to a stem. It was fastened to the side of the glass by a heavy web of dark silk, very much darker than the cocoon itself, which is a handsome russet brown. The inner lining is very glossy, and the whole fully three inches long.



XIV.

THE ROSY DRYOCAMPA.

I HAVE been April-fooled several times within the last hour. Not by a person; but by a moth — my beautiful Rosy Dryocampa. It was no April fool, but a very pleasant surprise, its coming out this April morning after its long, sound sleep, never once moving, in the black, ring-notched chrysalis, since it went into it on the twenty-sixth of last August. A beautiful little creature it is, especially the under wings,



FIG. 40.

which look, more than any thing else, like a stray rose-tinted sea-shell, such as one sometimes finds, nearly transparent, and almost as flat as a rose petal.

I was trying to sketch it, and it would stay so perfectly still that I would think, "Now, I shall have a good chance!" and lo! when one wing, or the crested head, was half drawn, away it would fly. Recaptured, I would begin again, and with the same success as before; so that when I had about six half-finished sketches, in as many different positions, I

remembered it was the first of April, and quietly put it under glass, until the picture was secured.

There are but two colors, rose and yellow. The upper wings deeply bordered with rose, behind, and broad epaulettes of the same color. The under body and feet are rose color, also, and there is the faintest hint of rose on the under wings, which are studiously kept out of sight. All the rest is a bright yellow. The head is tufted, and the eyes are set so far under in front as not to show, unless you peer under the tuft, where you see them, black and round, close to his little front feet. There is a triangle of yellow, bordered with red, between them, and a little triangular tuft of the same color at the base of each of the delicate antennæ. Much of the time when the moth is at rest these antennæ are completely hidden, by lying back close along the edge of the front wings (like those of the *Quinque maculatum*), so that you would be apt at first to think he had none. They have about thirty joints, as near as one can count them when in such constant vibration as they are pretty sure to be when in sight. He will keep perfectly still two hours at a time (if you are not attempting to take his picture), then fly about wildly for two or three minutes, and then for hours remain immovable, as if dead. This one prefers to stand showing but three feet—two on one side, and one on the other—and no coaxing draws out the shy foot. The under wings are kept out of sight, except a little margin in front, near the

head, which shows a small crescent of faint rose color below the upper wings. The antennæ of the female moth are simple, like a little strand of beads, while those of the male are spined, being larger, as are those of all male moths. The only other moth of this kind which I have seen went into the chrysalis state in the summer (July 5, 1877), and came out the last of the same month (July 27th), perfecting in that time the work, which — however soon completed, in the fall caterpillar — remains out of sight nearly half a year. Harris, in the description of the Rosy Dryocampa, says, "The caterpillar is unknown to me," and I have not seen it described elsewhere. The two which I had (one of which I watched through the change into the chrysalis) were taken from beneath the maple tree, and were nearly ready for their change. They do not spin any cocoon, nor attach themselves to the glass (like the caterpillar of the Danaïds and also of the Asterias, and others), but work off the caterpillar skin—the chrysalis first appearing of rather a bright green or yellowish color, and soon becoming quite black.

The summer chrysalis would move, when touched (advancing on the paper with a peculiar gliding motion, by means of the toothed edges of the rings); but the winter one was never seen to move a hair's breadth. The caterpillar has twelve rings, is a pale pea-green, and striped lengthwise (which gives it a somewhat checkered appearance) in narrow stripes of a little deeper shade of green. The head is a



FIG. 41.



FIG. 42.

russet-brown color, and there are two soft black horns on the second ring about one-third of an inch in length. The under side of the two rings before the last are a purplish-brown, edged all along with short, black spines. There are a few short, black spines on the last two rings, and the V-shaped tail is edged also with a border of them, as also is a line along each side of the body. There are minute black warts symmetrically arranged about each ring, about five on each. It is curious to compare a butterfly or caterpillar either with another or with some written description, and notice the exactness of repetition in spot, spine, and marking of every

sort. In writing as minute a description of a certain caterpillar as could be given from counting both spots and spines, I was pleased to find afterward a printed description answering count for count. There is not always the same similarity in their cocoons, as they will accommodate themselves to circumstances rather than give up the idea of building their home. The Polyphemus will always draw leaves together in a graceful manner about his cocoon; but one, from whom I took his supply of leaves, when about to spin, made his cocoon without it. It is true he was the only one of several which I had who died in his cocoon; whether from mortification that he was obliged to deviate from his usual plan, I never learned. But the chrysalids (except from some malformation) seem to be as exactly similar as the moths and caterpillars.



XV.

THE SATURNIA IO.

THE handsome Indian yellow moth, *Saturnia Io*, was one I learned backward. Finding a beautiful moth of this kind on a fence one evening at twilight, I secured him with delight,

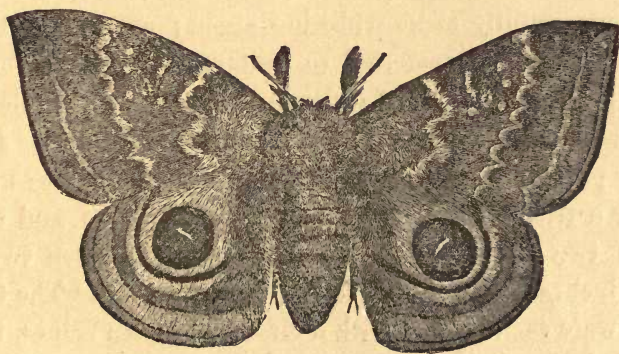


FIG. 43.

but with no knowledge of his name or from what sort of chrysalis or caterpillar he had come. After keeping him some days, I found him one afternoon apparently dead.

Touching him, or moving him along even, with a pencil, betrayed no sign of life, and he was carefully placed in a box containing several other specimens. While reading in the same room that evening, I was startled by an unusual sound, which, as I was alone, was a little annoying at first, but soon I perceived the noise came from the direction of a box of moths! And sure enough, my *Saturnia Io*, far from being dead, had taken occasion to call on each particular moth in the collection in the most unceremonious manner, ascertaining to its entire satisfaction, if not to mine, that none of the others had been put away (not to say buried) alive. Some delicate wings were detached from poor victims unable to return this unmercifully swift whisking about; and before the *Io* could be safely transferred to solitary confinement, he had brought confusion out of order in the most undesirable manner possible. So began my acquaintance with *Io*. In the latter part of the following August, a caterpillar was given me by a friend, of a kind I had not seen before, and soon I found two others like him. They were between two and three inches long, and of a light pea-green color. The twelve rings were each starred with a cluster of green spines, tipped with a dark purple, looking almost black. These were sharp and thorn-like. A line of purple brown ran along the lower part of each side, bordered on the lower edge with yellow. The hinder prop feet were a dark brown; the eight middle

feet purplish, with a brown finish at the bottom. The three pairs of true feet were purple. The head was green like the body, while the mouth was purple like the feet. The first ring was so completely covered with spines as to hide his head

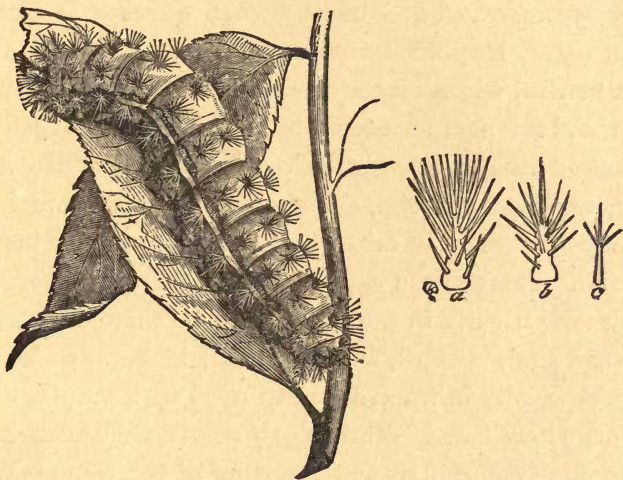


FIG. 44.

entirely when bent forward, as they usually were. There were six sets of these stars on each ring, except the last two (and five on each of those), and on the first four rings, which have on each side an extra cluster very low down.

These spines are very stiff, and remind one of porcupine

quills. The purple-brown line along the side, which begins at the fourth ring, bends down to the hinder prop-foot, leaving five clusters on the last ring. On each side of every ring is an oblong vertical breathing hole (spiracle), as in nearly all larvæ; for though these differ in number and some other respects in different caterpillars, yet their arrangement is uniformly symmetrical, and usually each segment is furnished with a pair. Examined with a microscope, this spiracle has first a vertical white center line, around which is an oval of brown, and this again bordered by an outside oval of jet black. He looked like a moving strip of star moss. He refused clover, dogwood, and elm, all of which they are said to like, probably because when taken he was about ready to become a chrysalid. There are in each star about thirty spines. Three shorter ones usually in the center, a second circle about these three, and again a third, which are still longer. Some of the spines, especially in front, are not tipped with purple, but end in delicate long hairs. While really pretty, they are a formidable looking caterpillar, and the sting of the spine is said to be as severe as that of a nettle. So curious a caterpillar was not difficult to be found described, and I soon learned, if these went safely through their changes, I should have the Saturnia Io moths. In a very short time the three had spun their cocoons and retired for a winter's sleep. Two of them seemed to strike up a close friendship at once. While the third went

off to a corner of the box and spun his cocoon independently, the other two worked closely side by side, forming a twin cocoon, joined together entirely on one side, and looking not unlike a double covered cradle. This being a new departure (as in the case of the *Polyphemus* cocoon, without the leaves on the outside) only one of the pair survived the experiment!



FIG. 46.

On the last day of winter (February 28, 1878) one of the covered cradles opened, and a beautiful female moth came out, just such an one as had made the bustling expedition among the box of specimens in the fall. On the third of March the single cocoon opened, and a male *Saturnia Io* appeared. It is of a deep Indian yellow, with the fore wings obliquely marked with purplish red, and a number of spots on each, close together, near the middle of the wing, which have been thought to resemble the letters A H, and which, with a little help of the imagination, do look more like those letters than any thing else. His mate is much darker, with less of the yellow and more of the brown and purple. Instead of the letters A H, there is a three-scalloped spot of rich, deep brown, edged with gray. The head is a rich snuff-brown, very velvety, and the handsome, velvety feet are of

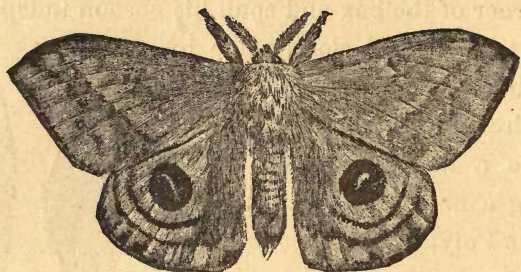


FIG. 47.

the same rich color. The other half of the double cocoon remained unopened.

After writing the above, it was my curious good fortune to find seven of these large caterpillars on one blade of Indian corn. There was not another to be found in the small field, and how these had chanced to congregate in such camp-meeting array was a mystery. They are "processionary" caterpillars, and although I had read this, I should not have realized it but for the curious sight which having so many at once afforded me. After they had been put under a large glass, it was a new and amusing sight to watch them march around—one lengthened, mossy line of green, all touching one another and walking as fast as if quite alone. They preferred the green leaves of the corn to any others which they are said to like and will eat. One after another they made their seven cocoons, and lay through the winter just passed, side by side, a little hamlet of sleepers—houses.

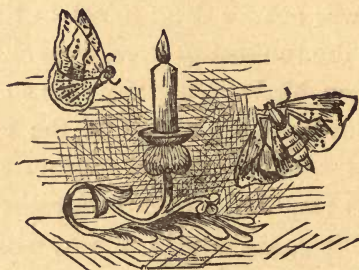
so still and apparently unoccupied as to have suggested a "Deserted Village," but whose occupants I knew were only waiting to surprise me on some coming spring morning with a regular Chestnut Street parade.

And the spring opening has come. Three of the sleepers have left their black, moveless, chrysalid homes. One has lived his little life, and two rich, brown, and purple ones are in a box near me (March 31, 1879). One of them has just made a pretty picture by flying upon a fresh, light-green blade of Indian corn (planted in my room expressly for their pleasure), almost, but not quite, too frail, in its own forced and tender growth, to support his swinging and fluttering little body. The corn was not for them to eat, as these moths may be classed among the tongueless ones, nor could they get any good from the green blades, had they ever so long a tongue. But if it were June, and they were in the corn-field, there they would deposit their eggs for the future star-moss caterpillars—more than two dozen of which, rather large, and of a clear, golden yellow, are now in a box, with a leaf of the corn for any possible coming need.

The pupa is black throughout, so that there is no change in it to indicate the coming of the moth, as is the case in so many of the brown or other lighter colored pupæ. The rings, however, become a little wider apart, and the spaces a little clearer, perhaps, between them. The end of the pupa, opposite the head, when looked at with a microscope, is

drawn in a little curiously, reminding one of the peculiarly pretty bud of the laurel blossom.

Another cocoon has since opened (April 10, 1879), and a beautiful lemon-yellow and variegated male *Io* has shaken out his beautiful wings, handsomer in his light spring suit than any of the others.



XVI.

SILVER GRAY.

STANDING on the heart of a blush rose, with his richly-shaded, silvery wings fluttering over its soft petals, my *Quinquemaculatum* moth makes a fine picture. His wings are spread just enough to show five orange spots encircled with black, which ornament each side of his body and give him his name. But the back of his head, between the shoulders, is his chief beauty. It is a rich, soft gray, curiously and regularly watered with black and white wavy lines. Of his six legs the last two pair are branched with three delicate spines. The eyes are very large and velvety black. The antennæ are not feathered, as are those of the *Polyphemus* moth, but many-jointed, tubular, and finely-pointed at the tip.

These antennæ are about an inch in length, and usually lie back close to the side of the body, seeming to form a corded edge to the upper wings, the points lying just under the wing. You would at first say he had no antennæ; but watch him a little, and they will soon be very apparent. The tongue is four or five inches in length, but when coiled, looks like a small wheel set between two feathery side pieces.

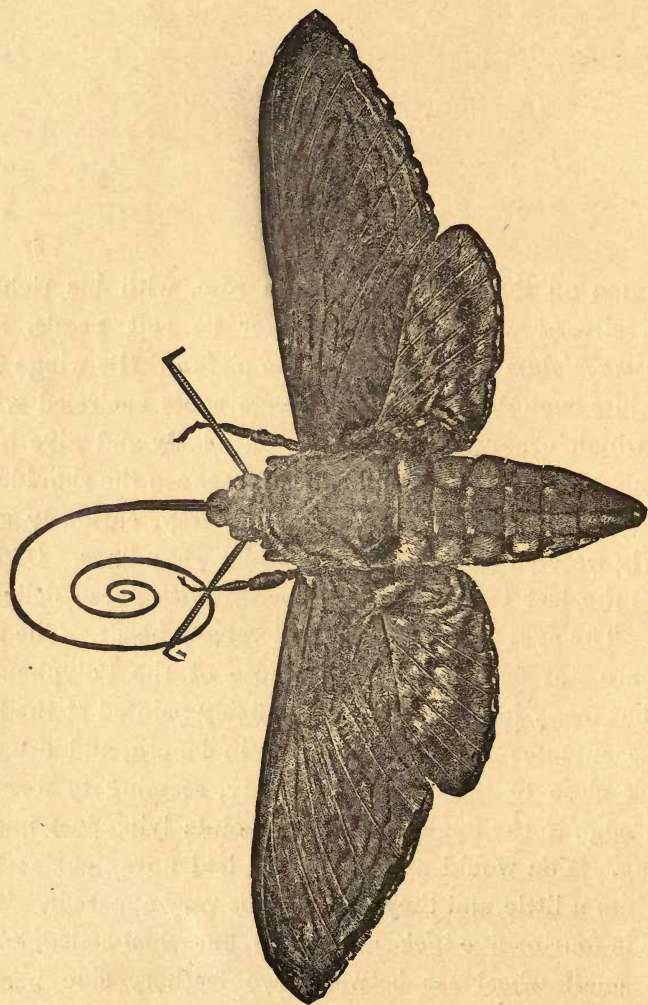


FIG. 48.

THE QUINQUEMACULATUM MOTH.

When freed from his chrysalis, his first care seemed to be for this long, slender tongue, which had been so specially cared for, during the chrysalis state, in its curious, pitcher-handle sheath. He unrolled and shook it again and again, curling and smoothing it as a child would a dandelion stem, and then reaching up, touched the top of the glass box (quite a high one) several times. Then he coiled it up quickly, and that was the last seen of his long tongue, except the hint of it in wheel form. Although tempted by fragrant flowers and sugared moss, he would not be induced to uncoil it again. A "greater green orchis," with its immensely long nectary of sweets, would no doubt have given him an opportunity to satisfy his hunger in a becoming manner; but no such flower was at hand, and scorning to use so remarkable an organ upon any ordinary repast, he quietly became a martyr to his sense of propriety, and died from hunger in the midst of plenty. And what is this dainty creature; or, rather, what was he? You will exclaim when I tell you he was the revolting-looking, large, green tomato worm.



FIG. 49.

Snappish and really dangerous in that form — requiring to be taken with great care — the change in his disposition seems as great as that in his external appearance. Although he does not equal the *Polyphemus* in gentleness (and I have seen no moth that does), still he is timid and quiet; although I fancy when touched there is a trace of the original disposition in the short, quick flutter he gives in response. It has not been an easy matter to secure this moth. It is a sphinx, and like all this class the caterpillar buries itself in the earth to go into the chrysalis form. Several large specimens of the tomato worm were caged in boxes, upon earth, and fed with tomato leaves. In due time they all disappeared in the earth. The same curiosity which leads children to take up seeds once or twice to see if they have sprouted, led to several attempts to see if these chrysalids were formed. Though Nature can not be delayed, neither will she be hurried.

At length, all the earth being shaken from them, two large well formed chrysalids appeared. These were allowed to lie



FIG. 50.

upon the earth all winter. They showed signs of life until

March, when they shriveled a little, and would no longer move when touched. They are now "hardened cases," with no hope of change.

This was too great a disappointment to bear without some attempt at remedy, and the thought was suggested of digging where last year's tomatoes had grown, to see if any unwatched ones had survived. The gardener soon brought two fine chrysalids to light. They were laid on boxes of earth in the empty glass case which the others had occupied, and Silver Gray broke the bands of one of these yesterday. The large moth made its exit at the usual place between the shoulders, leaving a mere parted line in the almost unbroken chrysalis. Even the long tongue-sheath was not broken or loosened from the breast. These two chrysalids were alike. The first two differed only in the tongue-case, one having the pitcher-handled case, as in the engraving, while the other had two short, straight cases, side by side.

What may we not believe possible in transformation, when we see the forbidding tomato worm, after a dark underground existence, come out into the silvery beauty of the *Quinque-maculatum*?

Shall *we* fear "the dark prison of a tomb," since the same power that opens the chrysalis rolls the stone from the long sealed sepulchre?

